ASN WX Radar facilities in FSUIPC4 (revised 9th May 2014)

This document explains the facilities provided in FSUIPC4 for creation of realistic weather radar displays using facilities provided in the recent updates for Active Sky Next (ASN).

A Lua script implementation of a simple WX display on a WideClient PC is provided in the installed Lua package for experimentation, along with macros for assignment of suitable button, switch or keyboard controls.

Note that, for a properly detailed radar image, you must have "detailed clouds" enabled in the simulator options.

INSTRUCTIONS

To use the WideClient example you need FSUIPC 4.93 or later, plus:

WideClient version 6.999i or later.
WXRadar.lua example display for use on a Client PC, in the Lua examples pack
WXRadar.mcro file for assigning controls in FSUIPC, in the Lua examples pack
WXRadar.FSQ file, for loading into an FSInterrogate2 window and
examining or manipulating the various parameters, , in the Lua examples pack

Parameters to appear in the FSUIPC4.INI [General] section (optional, separately)

ASNwxRadarPath = <full pathname for the radar array to be written>
ASNwxRadarBitmapPath = <full pathname for a corresponding radar bitmap>

To just see the bitmap you only need the latter. The former is for other processing or investigation.

Just for viewing the changing bitmaps, WideClient version 6.999i includes bitmap display facilities, with auto-updating. Just set the [User] parameter

Background=<full pathname to the bitmap file produced above>

and size the WideClient window as required.

For a more flexible system install WXRadar.Lua in the WideClient folder. This supports a client radar display with the current settings shown too. You'll need to set the path to the bitmap file in the first line (Note: use \\ for every single \ in paths, a Lua language requirement). You can also adjust window position and size in the first few lines.

Note that if you already use WideClient on the same PC for any time-critical processes, you would get smoother results all round by having the radar in a second instance of WideClient. To do this, make a new folder and put WideClient.exe, WideClient.INI and the WxRadar.lua files into it. Then edit that copy of WideClient.INI to change the ClassInstance parameter from 0 to 1. Make sure the protocol is set to TCP ("Protocol=TCP"), as the UDP alternative doesn't allow addressing separate instances. You can run this WideClient automatically from the other using a Run parameter in its INI file.

The radar options include:

- Main on/off switch, which also shows or hides the Lua generated window on the client.
- 16 colour display as per NOAA standard -- like a ground radar display, not correct for aircraft, but pretty. Normal default display is 4 colour including Magenta for turbulence.
- Stabilised antennae, where the aircraft pitch is NOT added because the radar stays level, at the set tilt, irrespective of aircraft pitch.
- Automatic multiscan, where a second beam is used, set by FSUIPC 5 degrees below the main one (not sure if 5 degrees is correct but seems fairly logical).

To select radar options, change range, tilt etc, just install the supplied WXradar.mcro file into FS's modules folder and assign buttons or keys in FSUIPC as needed. Note that it starts in "Off" mode and the "On" macro also sets the range to 40 nm so that it starts operation immediately. You might also want to make it set multiscan and stabilised mode at the same time -- for this change the x80 at the end of line 12.1 to x86.

Note that the range shouldn't be set greater than the cloud draw distance set in ASN options. I've set both my minimum and maximum CDD's to 160 nm to be sure I get good WX radar to that sort of distance, and it seems to work very well. The real world maximum of 320 nm can't be achieved.

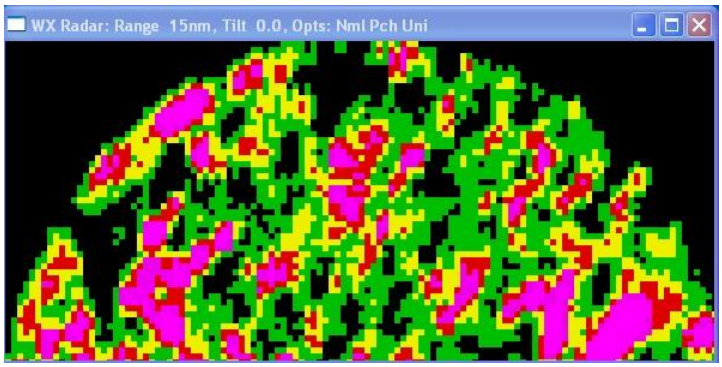
Example images

The bitmap provided is rectangular, providing data at the requested range in front of the aircraft. So the area represented is 'range' (r) nautical miles in depth and 2 x r in width, with the aircraft position being in the centre of the lower, leading edge.

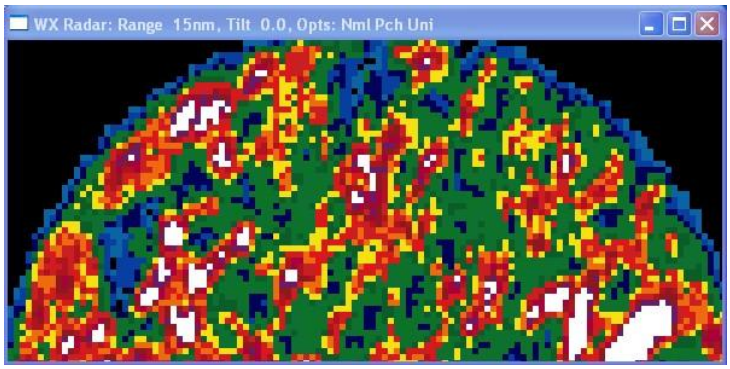
The scale is fixed -- each pixel represents a square 0.25nm x 0.25nm. Thus a range of 10 sm will give a bitmap size of 40 deep x 80 wide. The bigger the range, the bigger the bitmap. ASN will not supply data for a range exceeding the CDD (cloud draw distance) parameter (as ASN setting), and the example provided limits it to 160 nm in any case.

The bitmap is oriented in the direction of aircraft heading at the time the image was requested -- there are offsets providing the Heading supplied, as well as the Pitch if used. The Latitude and Longitude is at the time of the image being supplied. ASN provides a new one at approximately 3 second intervals, so an ND implementation using it should allow probably up to 15 degrees change of heading when in turns if an ultra smooth WX display is desired. The transformation of the image, or raw data, to do this is up to the ND implementer.

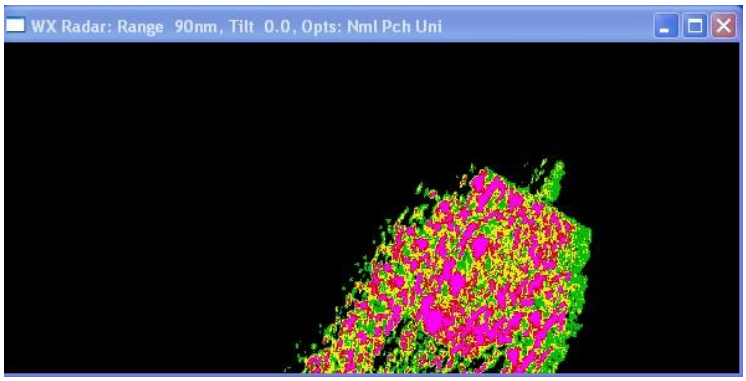
This image is with a 15nm range, in normal 4 colour mode. Note the magenta zones inidicating turbulence. The cut-off at 15nm from the aircraft, in the centre of the semi-circle, is evident.



This one is the same but in 16 colour (ground radar) mode. Pretty, but less useful for flying because most of the colouring isn't rally so relevant -- just rain or wet clouds:



And here is the same area, in normal 4-colour mode, but with a range of 90 nm.



Offset references for programming

Offsets 8600 - 8637 are used: 8600-861B and 8630-8637 are read only

```
// Status data, and icing (OUTPUT)
8600    BYTE        fASN; // ASN operating 1 = on, 0 = off
8601    BYTE        bAmbientIcing; // 0-4
8602    WORD        wSync; // increments each time radar array file is written
8604    WORD        wWidth; // Byte width of array
8606    WORD        wDepth; // Byte depth of array

// Wind Shear information (OUTPUT)
8608    float       fWshLat;
860C    float       fWshLon;
8610    float       fWshRange; // METRES
8614    float       fWshMinAlt; // Feet
8618    float       fWshMaxAlt; // Feet

// User Parameters for Radar operation (INPUT)
861C    WORD        wRange1; // nm, 0 = OFF
861E    short int   sTilt1; // degrees times 10, +up (FSUIPC adds pitch)
8620    WORD        wRange2; // nm, 2nd beam (optional) -- 0 to disuse
8622    short int   sTilt2; // defrees times 10, +up (FSUIPC adds pitch)
8624    WORD        wOptions;  // 2^7 = On /Off (0=off, 1=on)
                               // 2^2 = auto multiscan, 2nd beam 5 degrees below main beam
                               // 2^1 = aircraft pitch NOT to be added (stabilised antennae)
                               // 2^0 = 16 colour, like ground radar and ASN's own 'map'
8626    WORD wReserved;

// Data relating to file produced (OUTPUT)
8628    float       fLatitude; // Latitude of aircraft at time of file
862C    float       fLongitude; // Longitude of aircraft at time of file
8630    int         nHeading; // Heading (TRUE) of aircraft used in request
8634    float       fPitch; // Pitch of aircraft used in request (if added to tilts, else zero)
```